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L6: Entry 1 of 2 File: JPAB May 8, 2002

PUB-NO: JP02002127227A
DOCUMENT-IDENTIFIER: JP 2002127227 A
TITLE: METHOD AND APPARATUS FOR MANUFACTURING STAPLE FIBER- CONTAINING RUBBER SHEET

PUBN-DATE: May 8, 2002

INVENTOR-INFORMATION:
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MITSUBOSHI BELTING LTD

APPL-NO: JP2000329842
APPL-DATE: October 30, 2000

INT-CL (IPC): B29 C 47/20; B29 C 47/24

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method and apparatus for manufacturing a staple fiber-containing rubber sheet, capable of applying stretching force and shearing force to a staple fiber- containing rubber in the circumferential direction thereof so as to gradually increase them toward a discharge port to extrude a cylindrical molded object wherein staple fibers are oriented in the circumferential direction and further easily forming the cylindrical molded object immediately after extrusion into a sheet.

SOLUTION: The inner die 9 connected to a mandrel 8 is formed into a conical shape gradually expanded in its diameter toward the discharge port 11 and this inner die 9 is housed in an outer die 10. The inner die 10 is rotated centering around its axis to apply stretching force and shearing force to the staple fiber-containing rubber so as to gradually increase the same toward the discharge port in the circumferential direction thereof to extrude and mold the cylindrical molded object wherein the staple fibers are oriented in the circumferential direction. A linear slit part 51 is axially formed in the surface layer of the extruded cylindrical molded object 13 and tension is further applied to the slitted cylindrical molded object in the circumferential direction thereof to expand the slitted cylindrical molded object and the cylindrical molded object is cut along the linear slit part 51 by a cutting means 40 to be formed into a sheet.

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L6: Entry 2 of 2 File: DWPI May 8, 2002

DERWENT-ACC-NO: 2002-735803
DERWENT-WEEK: 200302

TITLE: Rubber sheet manufacturing method involves rotating inner die with mandrel to apply shear force on rubber to orient fibers in peripheral direction, and applying tensile force to rubber by supplying gas

PATENT-ASSIGNEE:

ASSIGNEE	CODE
MITSUBOSHI BELTING LTD	MIUA

PRIORITY-DATA: 2000JP-0329842 (October 30, 2000)

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PATENT-FAMILY:

	PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
☐	JP 2002127227 A	May 8, 2002		010	B29C047/20

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP2002127227A	October 30, 2000	2000JP-0329842	

INT-CL (IPC): B29 C 47/20; B29 C 47/24; B29 K 21:00; B29 K 105:12; B29 L 7:00

ABSTRACTED-PUB-NO: JP2002127227A
BASIC-ABSTRACT:

NOVELTY - A conical die (15) has an outer die (10) and rotatable inner die (9). A screw-type extruder (3) extrudes the short fiber mixed rubber into the space between the two dies. The inner die rotates with a mandrel (8), such that rubber mix expands towards the periphery gradually with fibers oriented in peripheral direction. A tensile force is applied to the rubber casting by spraying a gas and the rubber sheet is cut axially by cutters.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for rubber sheet manufacturing apparatus.

USE - For manufacturing rubber sheet containing short fibers.

ADVANTAGE - By applying a shear force on the rubber by rotating inner die, the fibers are oriented in the direction of periphery and the orientation is controlled by adjusting the circumferential speed of inside die. The sheet is easily finished

by cutting axially by the cutters on a linear cutting line, by applying a tensile force on the inner surface by supplying compressed gas.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic view of the rubber sheet manufacturing apparatus.

Extruder 3

Mandrel 8

Dies 9,10,15

Cutters 40,50

CHOSEN-DRAWING: Dwg.1/8

TITLE-TERMS: RUBBER SHEET MANUFACTURE METHOD ROTATING INNER DIE MANDREL APPLY SHEAR FORCE RUBBER ORIENT FIBRE PERIPHERAL DIRECTION APPLY TENSILE FORCE RUBBER SUPPLY GAS

DERWENT-CLASS: A32

CPI-CODES: A11-B02A; A11-B02B; A11-B07A; A12-S08A;

ENHANCED-POLYMER-INDEXING:
Polymer Index [1.1] 018 ; H0124*R ; S9999 S1581 Polymer Index [1.2] 018 ; ND05 ; ND07 ; N9999 N6042*R ; N9999 N5970*R ; K9892 ; N9999 N6279 N6268 ; J9999 J2915*R ; K9416 Polymer Index [1.3] 018 ; S9999 S1092 S1070 ; A999 A419

SECONDARY-ACC-NO:
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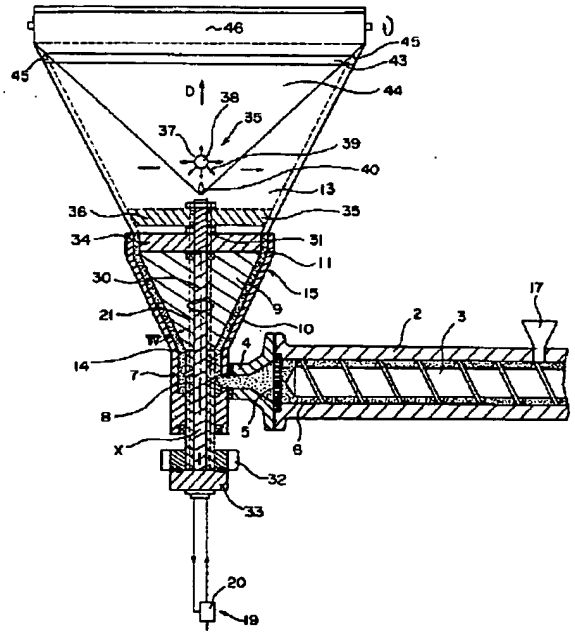
AJ02 AJ03 AM32 KL57 KL63
KL80 KL88 KW23

(54)【発明の名称】　短繊維入りゴムシートの製造方法及びその製造装置

(57)【要約】

【課題】　短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を与えることで、短繊維を円周方向に配向させた円筒状成形体を押出し、更に押出された直後の円筒状成形体を容易にシート化できる短繊維入りゴムシートの製造方法及びその製造装置を提供する。

【解決手段】　マンドレル８に連結した内ダイ９を吐出口１１に向って径を徐々に拡張させた円錐形としてこれを外ダイ１０に収容し、かつ内ダイ１０をその軸心中心に回転させながら、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を付与して、短繊維を円周方向に配向させた円筒状成形体１３を押出成形し、押出された円筒状成形体１３の表面層に軸方向へ直線状の切込み部５１を入れ、切込みを入れた円筒状成形体をさらに径を拡張させながら円周方向へ張力を与え、そして上記円筒状成形体を直線状の切込み部５１で切断手段４０によって切開しながらシートにする。



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【特許請求の範囲】

【請求項１】　短繊維を混入したゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造方法において、

マンドレルに連結した内ダイを吐出口に向って径を徐々に拡張させた円錐形としてこれを外ダイに収容し、かつ内ダイをその軸心中心に回転させながら、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を付与して、短繊維を円周方向に配向させた円筒状成形体を押出成形し、

押出された円筒状成形体の表面層に軸方向に直線状の切込み部を入れ、

切込みを入れた円筒状成形体をさらに径を拡張させながら円周方向へ張力を与え、

上記円筒状成形体を直線状の切込み部で切開しながらシートにする、ことを特徴とする短繊維入りゴムシートの製造方法。

【請求項２】　押出された直後の円筒状成形体をさらに円錐形状の補助ガイドで径を拡張させ、円周方向へ張力を与える請求項１記載の短繊維入りゴムシートの製造方法。

【請求項３】　カッターを円錐形状の補助ガイドを支持台にして円筒状成形体の表面へ押圧することで、軸方向へ直線状の切込み部を設ける請求項２記載の短繊維入りゴムシートの製造方法。

【請求項４】　円筒状成形体を切開するとき、圧縮気体を円筒状成形体内部に吹き付けながら円周方向へ張力を与える請求項１または２記載の短繊維入りゴムシートの製造方法。

【請求項５】　ガイド部材を切開したシートの両端部に当接する請求項１～４のいずれかに記載の短繊維入りゴムシートの製造方法。

【請求項６】　円筒状成形体を重力に抗する方向に押出すようにした請求項１～５のいずれかに記載の短繊維入りゴムシートの製造方法。

【請求項７】　内ダイの内部を冷却しながら軸心を中心に回転させる請求項１～６のいずれかに記載の短繊維入りゴムシートの製造方法。

【請求項８】　短繊維を混入したゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造装置において、

押出スクリューの回転により短繊維を含むゴムを混練するシリンダーと、

短繊維混入ゴムをマンドレルの回転によって移動させる押出部と、

マンドレルに連結した内ダイを外ダイに収容し、内ダイ

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の径を吐出口に向って徐々に拡張させるとともに、内ダイをその軸心中心に回転可能にし、円周方向への引き伸ばしとせん断力を付与して短繊維を円周方向に配向させた円筒状成形体に押出するダイ部と、

押出された直後の円筒状成形体の表面層に軸方向に直線状の切込み部を設ける切込み手段と、

切込みを入れた円筒状成形体にさらに円周方向へ張力を与える拡張手段と、

円筒状成形体を上記直線状の切込み部分で切開する切断手段と、を備えたことを特徴とする短繊維入りゴムシートの製造装置。

【請求項９】　拡張手段が、押出された直後の円筒状成形体をさらに径を拡張させ円周方向へ張力を与える円錐形状の補助ガイドである請求項８記載の短繊維入りゴムシートの製造装置。

【請求項１０】　切込み手段が円筒状成形体を表面から押圧して軸方向へ直線状の切込み部を設けるカッターであり、該カッターの支持台が円錐形状の補助ガイドである請求項９記載の短繊維入りゴムシートの製造装置。

【請求項１１】　拡張手段が、押出された直後の円筒状成形体内部に圧縮気体を吹き付けながら円周方向へ張力を与える気体吹き付け装置である請求項８または９記載の短繊維入りゴムシートの製造装置。

【請求項１２】　ガイド部材が切開したシートの両端部に当接するように配置されている請求項８～１１のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項１３】　軸心を中心に回転する内ダイは、内部を冷却する装置を備えている請求項８～１２のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項１４】　内ダイの径が吐出口に向って徐々に拡張するテーパー角度θは、$30° \leq \theta < 90°$であり、内ダイの最小径Ａと最大径Ｂの比率である拡張比Ｂ／Ａが１．５～１２．５である請求項８～１３のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項１５】　内ダイと外ダイの流路幅は、内ダイがマンドレルに連結した根元部から吐出口まで均一である請求項８～１４のいずれかに記載の短繊維入りゴムシートの製造装置。

【請求項１６】　円筒状成形体を重力に抗する方向に押出すようにダイ部を配置した請求項８～１５のいずれかに記載の短繊維入りゴムシートの製造装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は短繊維入りゴムシートの製造方法及びその製造装置に係り、詳しくはマンドレルに連結した内ダイを吐出口に向って径を拡張させて円錐形とし、この内ダイを回転させることによって、短繊維混入ゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に与えることで、短繊維を円周方向に配向させた円筒状成形体を押出し、更

に押出された直後の円筒状成形体を確実に切開してシートに仕上げる短繊維入りゴムシートの製造方法及びその製造装置に関する。

【0002】

【従来の技術】従来、未加硫ゴム中に短繊維を一定方向へ配向させる方法としては、図8（a）に示す圧延シート作製工程のように、回転速度を変えた一対のカレンダーロールに短繊維入り未加硫ゴムを投入し、圧延されたゴムシート中の短繊維をシートの圧延方向に配向させ、そして成形するベルト幅に応じて切断していた。その後、図8（b）に示す積層工程のようにカットした圧延シートを数枚重ね合わせて所定厚みに積層し、続いて図8（c）に示す巻付け工程のように短繊維が幅方向に配向した積層物を成形ドラムに巻き付けて伝動ベルトの作製に使用していた。

【0003】即ち、Vリブドベルトやローエッジ∨ベルトの伝動ベルトの製造方法では、円筒状の成型ドラムの周面に1～複数枚のカバー帆布と接着ゴム層とを巻き付けた後、この上にコードからなる心線を螺旋状にスピニングし、更に圧縮ゴム層を順次巻き付けて積層体を得た後、これを加硫してベルトスリーブにしていた。ここで使用する圧縮ゴム層は、上記の図8（b）に示すように3～4枚重ね合わせた厚みのもので、シート幅方向に短繊維が配向したものを成型ドラムに巻き付けていた。

【0004】しかし、圧延シートは、厚みを薄くしなければ、短繊維をシート圧延方向に充分に配向させることができないために、やむを得ずシートを重ねていたためにベルト成形用シートを得るには多大の工数を要していた。

【0005】これを改善する方法として、特公平6－9847号公報には、拡張ダイを取付けた押出機を用い、短繊維を押出円筒体の円周方向に配向させるもので、中間空間に、入口空間の所定の流路幅から出口空間の所定の流路幅まで流路幅が変化する拡大空間部を設け、拡張ダイの出口空間の断面積を入口空間の断面積より所定量大きく形成し、さらに入口部分の流路幅が中間部分の流路幅よりも狭く、出口部分の流路幅が中間部分の流路幅以下に設定したものが、提案された。

【0006】そして、特開平6－106602号公報には、押出した短繊維を円周方向に配向させた円筒状エラストマーを軸方向に切開する切断装置と、切開されたエラストマーを平板状に展開する展開装置を設け、更に押出装置と切断装置との間に案内装置を設けて、ここから空気を吹出すようにして、円筒状エラストマーの円周方向への収縮を抑えながら冷却し、不均一な収縮に起因する短繊維を配向の乱れを阻止し、またシートの両端と中央との距離が等しくなるように展開機構の傾きを調節できるようにしてフレアの発生を阻止した製造装置が開示されている。

【0007】

【発明が解決しようとする課題】しかしながら、従来の拡張ダイを使用する方法では、入口空間／中間空間、中間空間／出口空間の流路幅比率、入口部分／出口部分の半径、断面積の制御により3次元的に配向率の調整を行うものであるが、ダイ形状に起因する流れの力で配向率を制御しているため、ダイを交換しなければ配向率を変えることができなかった。

【0008】また、押出装置と切断装置との間に設けた案内装置で空気を吹出して、円筒状エラストマーを冷却して円周方向への収縮を抑えながら、不均一な収縮に起因する短繊維を配向の乱れを阻止する製造装置では、押出された円筒状エラストマーを空冷した後に刃物で軸方向へ切断するところから、刃物にかなりの負担がかかり、特に厚みの大きい円筒状エラストマーを長時間にわたって切開するときには、刃物の交換は必須であった。

【0009】本発明はかかる問題に着目し、鋭意研究した結果、成形体の厚みに関係なく、マンドレルに連結した内ダイを吐出口に向って径を徐々に拡張させて円錐形とし、そして内ダイをその軸心中心に回転させることによって、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を与えることで、短繊維を円周方向に配向させた円筒状成形体を押出し、更に押出された直後の円筒状成形体を容易にシート化できる短繊維入りゴムシートの製造方法及びその製造装置を提供することを目的とする。

【0010】

【課題を解決するための手段】上記した目的を達成すべく本願請求項1記載の発明は、短繊維を混入したゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造方法において、（1）マンドレルに連結した内ダイを吐出口に向って径を徐々に拡張させた円錐形としてこれを外ダイに収容し、かつ内ダイをその軸心中心に回転させながら、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に付与して、短繊維を円周方向に配向させた円筒状成形体を押出成形し、（2）押出された円筒状成形体の表面層に軸方向に直線状の切込み部を入れ、（3）切込みを入れた円筒状成形体をさらに径を拡張させながら円周方向へ張力を与え、（4）上記円筒状成形体を直線状の切込み部で切開しながらシートにする、短繊維入りゴムシートの製造方法にある。

【0011】この製造方法では、外ダイに収容した円錐形の内ダイをその軸心中心に回転させることにより、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に付与することができることから、短繊維を円周方向に配向させた円筒状成形体を得ることができる。しかも、内ダイの周速度を調節することによって、厚みの大きい円筒状成形体でも

短繊維を円周方向に配向させることができ、また内ダイの周速度を変量することで、短繊維の円周方向への配向率を制御できるのでダイの交換が不要になる。また、押出された円筒状成形体の表面層に予め軸方向へ直線状の切込み部を入れた後、円筒状成形体に円周方向へ張力を与えつつ、該切込み部で切開しながら容易にシートに仕上げることが可能になる。

【００１２】本願請求項２記載の発明は、押出された直後の円筒状成形体をさらに円錐形状の補助ガイドで径を拡張させ、円周方向へ張力を与える短繊維入りゴムシートの製造方法であり、切開によるシート化が容易になる。

【００１３】本願請求項３記載の発明は、カッターを円錐形状の補助ガイドを支持台にして円筒状成形体の表面へ押圧することで、軸方向へ直線状の切込み部を設ける短繊維入りゴムシートの製造方法にあり、予め円筒状成形体の円周方向に配向した短繊維を部分的に切断し、その後の切開によるシート化が容易になる。

【００１４】本願請求項４記載の発明は、円筒状成形体を切開するとき、圧縮気体を円筒状成形体内部に吹き付けながら円周方向へ張力を与える製造方法であり、切開すると容易にシート化することができる。

【００１５】本願請求項５記載の発明は、ガイド部材を切開したシートの両端部に当接する製造方法であり、切開したシートの端部が重なることなく容易にシート化することができる。

【００１６】本願請求項６記載の発明は、円筒状成形体を重力に抗する方向に押出すようにした製造方法であり、円筒状成形体が重力により変形せず、寸法変化の少ない状態で押出が可能になる。

【００１７】本願請求項７記載の発明は、内ダイの内部を冷却しながら軸心を中心に回転させる製造方法であり、内ダイの内部を冷却することで、内ダイの周速を高めても内部発熱によるゴムのスコーチを阻止し、その結果厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができる。

【００１８】本願請求項８記載の発明は、短繊維を含むゴムをシリンダーの押出スクリューで混練りした後、マンドレルの先端に接続したダイから押出し、得られた短繊維入り筒状のゴム形体からシートに仕上げる短繊維入りゴムシートの製造装置において、押出スクリューの回転により短繊維を含むゴムを混練するシリンダーと、短繊維混入ゴムをマンドレルの回転によって移動させる押出部と、マンドレルに連結した内ダイを外ダイに収容し、内ダイの径を吐出口に向って徐々に拡張させるとともに、内ダイをその軸心中心に回転可能にし、円周方向への引き伸ばしとせん断力を付与して短繊維を円周方向に配向させた円筒状成形体に押出するダイ部と、押出された直後の円筒状成形体の表面層に軸方向へ直線状の切込み部を設ける切込み手段と、切込みを入れた円筒状成形体にさらに円周方向へ張力を与える拡張手段と、円筒状成形体を上記直線状の切込み部分で切開する切断手段と、を備えた短繊維入りゴムシートの製造装置にある。

【００１９】請求項１記載と同様に吐出口に向って徐々に大きくなる円周方向に引き伸ばしと回転方向のせん断力を同時に短繊維混入ゴムに与えるため、短繊維を円周方向に配向させた円筒状成形体を得ることができる。しかも、内ダイの周速度を調整することによって、厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができ、また内ダイの周速度を変量することで、短繊維の円周方向への配向率を制御できてダイの交換が不要になる。また、押出された円筒状成形体の表面層に予め軸方向へ直線状の切込み部を入れた後、円筒状成形体に円周方向へ張力を与えつつ、該切込み部で切開するために容易にシートに仕上げることが可能になる。

【００２０】本願請求項９記載の発明は、　拡張手段が、押出された直後の円筒状成形体をさらに径を拡張させ円周方向へ張力を与える円錐形状の補助ガイドである短繊維入りゴムシートの製造装置にあり、円筒状成形体には円周方向に張力がかかっているために、切開によるシート化が容易になる。

【００２１】本願請求項１０記載の発明は、切込み手段が円筒状成形体を表面から押圧して軸方向へ直線状の切込み部を設けるカッターであり、該カッターの支持台が円錐形状の補助ガイドである短繊維入りゴムシートの製造装置にあり、予め円筒状成形体の円周方向に配向した短繊維を部分的に切断し、その後の切開によるシート化が容易になる。

【００２２】本願請求項１１記載の発明は、拡張手段が押出された直後の円筒状成形体内部に圧縮気体を吹き付けながら円周方向へ張力を与える気体吹き付け装置である短繊維入りゴムシートの製造装置にあり、請求項９と同様に円筒状成形体には円周方向に張力がかかっているために、切開によるシート化が容易になる。

【００２３】本願請求項１２記載の発明は、ガイド部材が切開したシートの両端部に当接するように配置されている短繊維入りゴムシートの製造装置にあり、切開したシートの端部が重なることなく完全にシート化することができる。

【００２４】本願請求項１３記載の発明は、軸心を中心に回転する内ダイは、内部を冷却する装置を備えている短繊維入りゴムシートの製造装置にあり、内ダイを冷却することで、内ダイの周速を高めることができ、その結果厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができる。

【００２５】本願請求項１４記載の発明は、内ダイの径が吐出口に向って徐々に拡張するテーパー角度θが$30° \leq \theta < 90°$であり、内ダイの最小径Ａと最大径Ｂの比率である拡張比Ｂ／Ａが１．５～１２．５である短繊維入りゴム成形体の製造装置にある。

【００２６】本願請求項１５記載の発明は、内ダイと外ダイの流路幅が、内ダイがマンドレルに連結した根元部から吐出口まで均一である短繊維入りゴム成形体の製造装置にある。

【００２７】本願請求項１６記載の発明は、円筒状成形体を重力に抗する方向に押出すようにダイ部を配置した製造装置にあり、円筒状成形体が重力により変形せず、寸法変化の少ない状態で押出が可能になる。

【００２８】

【発明の実施の形態】以下、図１は本発明に係る短繊維入りゴム成形体の製造装置の概略図、図２は内ダイの断面図である。本発明の短繊維入りゴム成形体の製造装置１では、押出スクリュー３の回転により短繊維を含むゴムを混練するシリンダー２と、多孔板５を通過した短繊維混入ゴム６を次の管へ移動させる連結管４と、連結管４から送られてきた短繊維混入ゴム６をマンドレル８の回転によって次工程へ移動させる押出部７と、マンドレル８に連結した内ダイ９を吐出口１１に向って径を徐々に拡張させて円錐形としてこれを外ダイ１０に収容し、かつ内ダイ９をその軸心中心に回転させながら、短繊維混入ゴム６を吐出口１１に向って徐々に大きくなる円周方向の引き伸ばしとせん断力を同時に付与して、短繊維を円周方向に配向させた円筒状成形体１３を押出成形するダイ部１５と、円筒状成形体の表面層に軸方向へ直線状の切込み部を設ける切込み手段５０と、切込みを入れた円筒状成形体にさらに円周方向へ張力を与える拡張手段３５と、そして円筒状成形体を上記直線状の切込み部分で切開する切断手段４０とを備えている。

【００２９】シリンダー２はこの中に回転可能に押出スクリュー３を収容し、短繊維を含むゴム配合物を原料投入口１７から入れて押出スクリュー３の回転によって短繊維とゴムとを混練して短繊維混入ゴム６にする。この時にシリンダー２内の空気やゴム配合物から発生したガス等は排気口（図示せず）から排出される。シリンダー２の温度はゴム種に応じて変更するが、通常４０～１００°Ｃに調節され、短繊維がゴムにミキシングしやすい温度にする。また、この場合の混練時間はゴムの加硫が進行しない程度に調節する。

【００３０】連結管４は、短繊維混入ゴム６を押出部７までガイドするものである。

【００３１】押出部７では、連結管４から送られてきた短繊維混入ゴム６に押出部７に収容されたマンドレル８の回転によってせん断力を与えながら、該短繊維混入ゴム６を４０～１００°Ｃまで加熱して熱可塑化し、押出成形しやすい状態にする。

【００３２】ダイ部１５はマンドレル８に連結した内ダイ９を吐出口１１に向って径を徐々に拡張させて円錐形とし、これを外ダイ１０に収容し、かつ内ダイ９をその軸心Ｘ中心に回転させながら、短繊維混入ゴム６を吐出口１１に向って徐々に大きな円周方向への引き伸ばしとせん断力を付与して、短繊維を円周方向に配向させた円筒状成形体１３を押出成形する。

【００３３】そして、ダイ部１５は水平に配置されたシリンダー２と直角に固定され、しかも吐出口１１から押出される円筒状成形体１３を重力に抗するように置かれ、円筒状成形体１３が重力により変形せず、寸法変化の少ない状態で押出を可能にしている。

【００３４】内ダイ９とマンドレル８は間隙を設けて支軸３０に装着し、支軸３０は一端がナット３１で固定された固定板３４に固定され、また他端がフレーム３３に支持されている。駆動ベルト（図示せず）を取付けたプーリ３２はマンドレル８に固着され、該駆動ベルトの走行によって、支軸３０を軸芯として内ダイ９とマンドレル８を同時に回転させる。

【００３５】また、内ダイ９と外ダイ１０の流路幅Ｗは、内ダイ９がマンドレル８に連結した根元部１４から吐出口１１まで均一になり、円筒状成形体１３の押出にブレーキをかけることなく軸方向Ｄへスムーズに流し、また内部歪みのない均一な厚みの円筒状成形体１３に仕上げる。

【００３６】内ダイ９の形状は、せん断力の大きさに影響を与える要因になる。本実施例では図２に示すように、根元部１４から吐出口１１に向って徐々に径が拡張するテーパー角度θが３０°≦θ＜９０°であり、内ダイ９の最小径Ａが２０～１７０ｍｍ、最大径Ｂが１００～２５０ｍｍ、そしてその比率である拡張比Ｂ／Ａが１．５～１２．５に設定される。この設定範囲未満であれば、内ダイ９の吐出口１１付近での円周方向への引き伸ばしが小さくて、厚みの大きな円筒状成形体１３の外層では短繊維が円周方向に配向しなくなる。一方、この設定範囲を越えると、円周方向への引き伸ばしが大きくなり過ぎて、押出圧力が劣る場合には、円筒状成形体１３が裂けやすい。

【００３７】また、内ダイ９の回転数と最大径Ｂによって決定される周速度もせん断力の大きさに影響を与えている。その周速度は２．５～３５ｃｍ／秒であり、好ましくは５．０～２０ｃｍ／秒であり、２．５ｃｍ／秒未満の場合には、内ダイ９の吐出口１１付近でのせん断力が小さくて、肉厚の大きな円筒状成形体１３の外層では短繊維が円周方向に配向しにくくなり、一方３５ｃｍ／秒を越えると、せん断力が大きくなって、内部発熱が大きくなり、該短繊維混入ゴム６の加硫によってゴム焼けが発生する。

【００３８】内ダイ９と外ダイ１０間の短繊維混入ゴム６の内部発熱を抑制するために、マンドレル８とこれに連結した内ダイ９の内部に冷却水を循環させる冷却装置１９を設けることができる。冷却装置１９では、内ダイ９の外部から冷却水を入れポンプ２０によって内ダイ９とマンドレル８内に設けた通路２１を通過させて内ダイ９へ排出して循環させる。上記冷却装置１９はゴムの内

部発熱を押さえることができることから、内ダイ９の周速度を高めることができ、肉厚の大きくても短繊維が円周方向に配向した円筒状成形体１３を押出成形することができる。

【００３９】切込み手段５０は、図４に示すように押出された直後の円筒状成形体１３の表面層に軸方向Ｄに沿って直線状の切込み部５１を設ける機能を有している。即ち、回転する円盤状の切込みカッター５２が円筒状成形体１３の表面層を押圧して、円周方向に配向した短繊維の一部を切断し、連続した直線状の切込み部５１を形成するが、上記円筒状成形体１３の内部には下記に示す円錐形状の補助ガイド３６が接しているため、これが切込みカッター５２の支持台として機能している。円筒状成形体１３への切込み部５１の深さは、円筒状成形体１３の厚さに対して３０～９０％が好ましい。３０％未満では、次の工程であるシートの切開が困難になる。

【００４０】押出し直後の円筒状成形体１３に円周方向へ張力を与える拡張手段３５の一つとして、円錐形状の補助ガイド３６が支軸３０に空転可能に挿入されている。補助ガイド３６はポリアミド樹脂、フッ素樹脂などの円筒状成形体１３との離型性に富みかつ軽量なものが好ましく、押出された直後の円筒状成形体１３が径を拡張する方向へ変形する機能があれば、寸法は問わないが、軸方向Ｄへ向って徐々に径が拡張するものであればよい。そのテーパー角度は５～６０°であり、５°未満になると、円周方向への張力が小さくて容易に切開できなくなり、また円筒状成形体１３がシート化するまでの距離が長くなって、切開したシート４４が自重により変形し正しく切開できなくなる不具合が起る。一方６０°を越えると、円周方向へ張力が大きくなりすぎて、切開方向が不安定になり左右対称に正しく切開できなくなることがある。

【００４１】また、他の拡張手段３５としては、圧縮空気を排出する気体吹き付け装置３７であり、押出された直後の円筒状成形体１３を膨張させて円周方向へ引張る機能と円筒状成形体１３を早期の冷却する機能を備えている。この気体吹き付け装置３７は、円筒状成形体１３の外部に配置され、圧縮空気を供給するコンプレッサー（図示せず）と、これに接続し円筒状成形体１３の内部に設置されたノズル３８からなり、圧縮空気３９をノズル３８から多方向へ排出して円筒状成形体１３を膨張させ円周方向へ張力を与える。これによって、円筒状成形体１３の切開作業が容易になり、また円筒状成形体１３を早期に冷却して、ゴムのスコーチを防ぎ品質を安定化させる働きがある。

【００４２】円筒状成形体１３を軸方向Ｄへ切開する切断手段４０は、カッター、ナイフといった刃物、あるいはレーザーナイフ、超音波振動からなり、円筒状成形体１３を引裂くように切断するもので、円筒状成形体１３の中央部分に位置して左右対称に切断する。無論、刃物のような切断手段４０に加熱すれば、円筒状成形体１３の切開を容易にすることもできる。また、ここで使用する刃物の場合、自転できる回転体刃物が好ましく、これによって円筒状成形体１３を容易に切断することができる。

【００４３】ガイド部材４３は例えば合成樹脂製、金属製の棒状体、筒状体であり、両端部４５が切開したシート４４の両端部４５に当接するようにガイドロール４６の手前に配置されている。切開したシート４４の端部４５が折れ曲がることなく完全にシート化し、ガイドロール４６へ巻付けて、連続して移動させることができる。

【００４４】ここで使用するゴムは、天然ゴム、ブチルゴム、スチレンーブタジエンゴム、クロロプレンゴム、エチレンープロピレンゴム、アルキル化クロロスルファン化ポリエチレン、水素化ニトリルゴム、水素化ニトリルゴムと不飽和カルボン酸金属塩との混合ポリマー、エチレンープロピレンゴム（ＥＰＲ）やエチレンープロピレンージエンモノマー（ＥＰＤＭ）からなるエチレンーα－オレフィンエラストマー等のゴム材の単独、またはこれらの混合物が使用される。ジエンモノマーの例としては、ジシクロペンタジエン、メチレンノルボルネン、エチリデンノルボルネン、１，４－ヘキサジエン、シクロオクタジエンなどがあげられる。

【００４５】上記ゴムには、アラミド繊維、ポリアミド繊維、ポリエステル繊維、綿等の繊維からなり繊維の長さは繊維の種類によって異なるが１～１０ｍｍ程度の短繊維が用いられ、例えばアラミド繊維であると３～５ｍｍ程度、ポリアミド繊維、ポリエステル繊維、綿であると５～１０ｍｍ程度のものが用いられる。その添加量はゴム１００重量部に対して１０～４０重量部である。

【００４６】更に、本発明のゴムには、軟化剤、カーボンブラックからなる補強剤、充填剤、老化防止剤、加硫促進剤、加硫剤等が添加される。

【００４７】上記軟化剤としては、一般的なゴム用の可塑剤、例えばジブチルフタレート（ＤＢＰ）、ジオクチルフタレート（ＤＯＰ）等のフタレート系、ジオクチルアジペート（ＤＯＡ）等のアジペート系、ジオクチルセバケート（ＤＯＳ）等のセバケート系、トリクレジルホスフェート等のホスフェートなど、あるいは一般的な石油系の軟化剤が含まれる。

【００４８】本発明では、予めゴム少なくとも短繊維をオープンロール、混練機などによって荒練してマスターバッチを作製する。この方法では、オープンロールによってポリマー１００重量部に１０～４０重量部の短繊維を投入して混練した後、混練したマスターバッチをいったん放出し、これを２０～５０°Ｃまで冷却する。これはゴムのスコーチを防止するためである。

【００４９】尚、短繊維とともに１～１０重量部の軟化剤を投入することができる。これによって短繊維とゴムのなじみが良くなり、ゴム中への分散が良くなるばかり

か、短繊維自体が絡み合って綿状になるのを防ぐ効果がある。即ち、軟化剤が短繊維に浸透し、素繊維同士の絡み合いがほぐれるための潤滑剤としての役割をはたし、短繊維が綿状になるのを阻止し、かつ短繊維とゴムのなじみが良くなって短繊維の分散が良くなる

【００５０】続いて、短繊維を含んだゴムをシリンダー２の押出スクリュー３で混練りした後、マンドレル８の先端に接続したダイ部１５から押出して円筒状成形体１３を製造するが、上述のごとくマンドレル８に連結した内ダイ９を吐出口に向って径を徐々に拡張させて円錐形とし、これを外ダイ１０に収容し、かつ内ダイ９をその軸心Ｘ中心に回転させながら、短繊維混入ゴム６を吐出口１１に向って徐々に大きくなる円周方向の引き伸ばしとせん断力を付与して、短繊維２２を円周方向に配向させた円筒状成形体１３を押出成形する。

【００５１】その後、連続して押出成形された円筒状成形体１３は、短繊維２２が内層から外層にかけて円周方向に配向した厚さ１～１０ｍｍのものであり、上記拡張手段３５、切開手段４０、ガイド部材４３を組み合せて用いることによって押出方向に連続して切開し、短繊維２２が幅方向に配向した幅（内ダイ９の最大径Ｂ×π）の連続した長尺の完全なシート４４を得ることができる。これを次工程の成型ドラムの周面に巻付け、その後伝動ベルトの成形に使用することができる。

【００５２】

【実施例】次に、短繊維入りゴム成形体の製造方法の具体的実施例を以下に示す。

実施例１～２

表１に示すクロロプレンゴム配合物、表２に示すＥＰＤＭゴム配合物を用い、予めオープンロールによってゴムに短繊維を投入して混練した後、混練したマスターバッチをいったん放出し、これを常温まで冷却する。このマスターバッチと他の配合剤を図１に示す短繊維入りゴム成形体の製造装置のシリンダーに投入し、押出スクリューの回転により短繊維を混入した。そして、表３に示す条件で内ダイをその軸心中心に回転させながら、短繊維混入ゴムを吐出口に向って徐々に大きくなる円周方向の引き伸ばしとせん断力を付与して、短繊維を円周方向に配向させた円筒状成形体を押出成形した。

【００５３】更に、連続して押出された円筒状成形体に、回転軸に対して空転可能に装着された円錐形状の補助ガイド（テーパー角度３０°、長さ６０ｍｍ）によってさらに円周方向へ張力を与え、また気体吹き付け装置により気圧６ｋｇｆ／ｃｍ²の圧縮空気をノズルから供給して円筒状成形体を膨張させて円周方向へ張力を与えた。そして、切断手段としてナイフを使用し、また棒状のガイド部材（直径３０ｍｍ、長さ６００ｍｍ）をガイドロールの手前に配置し、切開したシートの両端部に当接させた。

【００５４】

【表１】

配合薬品	重量部
CR（硫黄変性タイプ）	１００
ステアリン酸	２
ナイロンカット糸	１５
アラミドカット糸	５
オイル	５
カーボンブラック	２５
老化防止剤	４
ビスマレイミド	２
ＺｎＯ	５

【００５５】

【表２】

配合薬品	重量部
EPDM	１００
ﾅｲﾛﾝｶｯﾄ糸	１５
ｱﾗﾐﾄﾞｶｯﾄ糸	５
ｽﾃｱﾘﾝ酸	１
酸化亜鉛	５
ｶｰﾎﾞﾝﾌﾞﾗｯｸ	５０
ｵｲﾙ	１０
老化防止剤	２
N,N-m-ﾌｪﾆﾚﾝｼﾞﾏﾚｲﾐﾄﾞ	２
ﾊﾟｰｵｷｻｲﾄﾞ	８

【００５６】本実施例における成形条件の押出スクリューの温度と回転数、内ダイの周速度（変量）と温度、円筒状成形体の厚みと外径、吐出量、円筒状成形体の内外層温度、円筒状成形体の厚み、内ダイの最小径、最大径、拡張比、切込み部の深さ、補助ガイドのテーパー角度と長さ、圧縮空気の圧力、そして棒状のガイド部材の直径、長さ等を表３に示す。

【００５７】

【表３】

	実施例1	実施例2
ゴム種	CR	EPDM
スクリュー温度（℃）	45	90
スクリュー回転数（rpm）	5．0	5．0
シリンダー後部温度（℃）	70	85
シリンダー前部温度（℃）	75	90
内ダイ温度（℃）	75	90
内ダイ周速度	2．5～15	5～15
内ダイの最小径A（mm）	54	54
内ダイの最大径B（mm）	190	190
内ダイの最大径B／最小径A	3．5	3．5
内ダイの長さ（mm）	150	150
吐出量（kg／hr）	10	22．0
円筒状成形体外層温度（℃）	80～110	90～110
円筒状成形体内層温度（℃）	80～125	100～120
円筒状成形体の厚み（mm）	4．0	4．0
切込み部の深さ（mm）	2．4	2．4
補助ガイドのテーパー角度（°）	30	30
補助ガイドの長さ（mm）	60	60
圧縮空気の圧力（kgf／cm²）	6	6
ガイド部材の直径（mm）	30	30
ガイド部材の長さ（mm）	600	600

【0058】かくして得られたシートは端部の重なりもなく、連続してトラブルなく切開することができた。また、シートの短繊維配向性の評価を行なった。この評価では、図5に示すようにシートを4枚にスライスして外層①から内層④の4層に区分した。これらの各シートの円周方向と軸方向のそれぞれの引張強度（TB）をJIS K6251に準じて測定し、引張強度比（TB比）（円周方向／軸方向）を求めた。円周方向の引張強度が軸方向の引張強度に比べて大きい程、即ち引張強度比が大きいほど、短繊維の円周方向への配向性が良好になっている。その結果を図6と図7に示す。

【0059】これによると、外層と内層には短繊維配向性の差がなく、また内ダイの周速度が高くなるにつれて、TB比が高くなり、短繊維がより円周方向に配向していることが判る。

【0060】

【発明の効果】以上のように本願請求項に係る発明では、外ダイに収容した円錐形の内ダイをその軸心中心に回転させることにより、短繊維を含むゴムに吐出口に向って徐々に大きくなる円周方向への引き伸ばしとせん断力を同時に付与することができることから、短繊維を円周方向に配向させた円筒状成形体を得ることができる。しかも、内ダイの周速度を調節することによって、厚みの大きい円筒状成形体でも短繊維を円周方向に配向させることができ、また内ダイの周速度を変量することで、短繊維の円周方向への配向率を制御できるのでダイの交換が不要になる。また、押出された円筒状成形体の表面層に予め軸方向へ直線状の切込み部を入れた後、円筒状＊成形体に円周方向へ張力を与えつつ、該切込み部で切開しながら容易にシートに仕上げることが可能になる効果がある。

【図面の簡単な説明】

【図1】本発明に係る短繊維入りゴム成形体の製造装置の概略図である。

【図2】内ダイの断面図である。

【図3】円筒状成形体に直線状の切込み部を入れ、さらに円周方向へ張力を与えながら、上記円筒状成形体を切開してシートにする状態を示す説明図である。

【図4】図3のZ－Z方向の断面図である。

【図5】円筒状成形体をナイフで切開して得たシートを外層から内層にかけて4層にスライスした状態を示す図である。

【図6】実施例1に係り、クロロプレンゴム配合物を用いた得られたシートの各スライス層ごとのTB比（引張強度比）と内ダイの周速度との関係を示すグラフである。

【図7】実施例2に係り、EPDMゴム配合物を用いた得られたシートの各スライス層ごとのTB比（引張強度比）と内ダイの周速度との関係を示すグラフである。

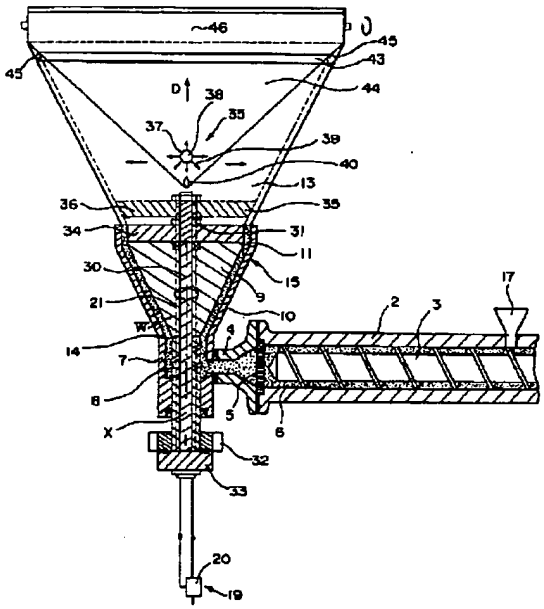
【図8】従来における未加硫ゴム中に短繊維を一定方向へ配向させる圧延シート作製工程を（a）に、カットした圧延シートを数枚重ね合わせて所定厚みに積層する積層工程を（b）に、そして積層物を成形ドラムに巻き付ける巻付け工程を（c）に示す。

【符号の説明】

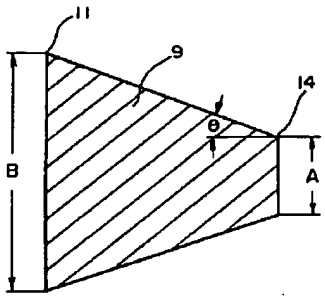
1　短繊維入りゴム成形体の製造装置

2　シリンダー
3　押出スクリュー
4　連結管
6　短繊維混入ゴム
7　押出部
8　マンドレル
9　内ダイ
10　外ダイ
11　吐出口
13　円筒状成形体
15　ダイ部
35　拡張手段
36　補助ガイド
37　気体吹き付け装置
40　切断手段
43　ガイド部材
44　シート
50　切込み手段
51　切込み部
52　切込みカッター

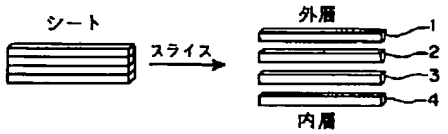
【図1】



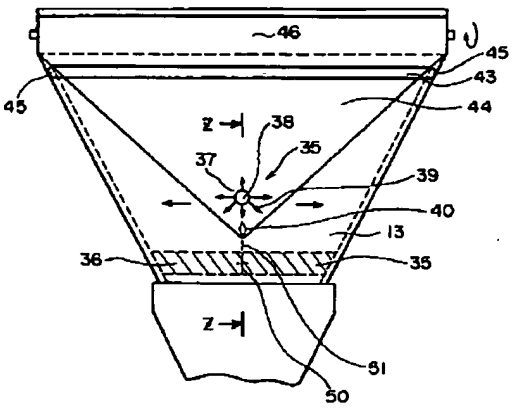
【図2】



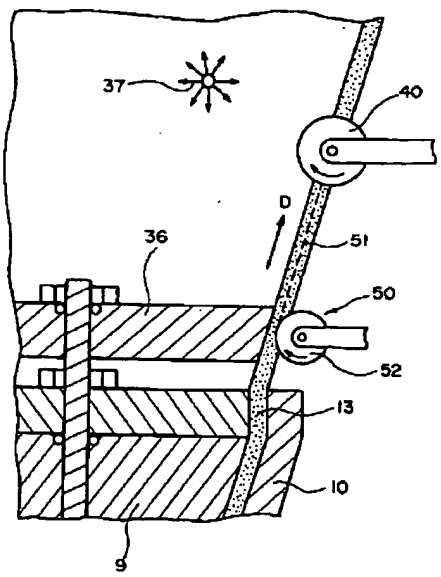
【図5】



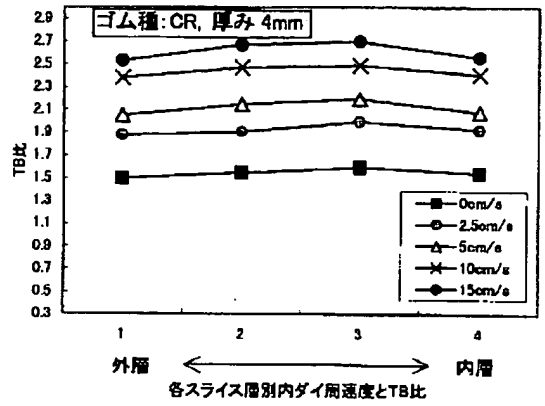
【図3】



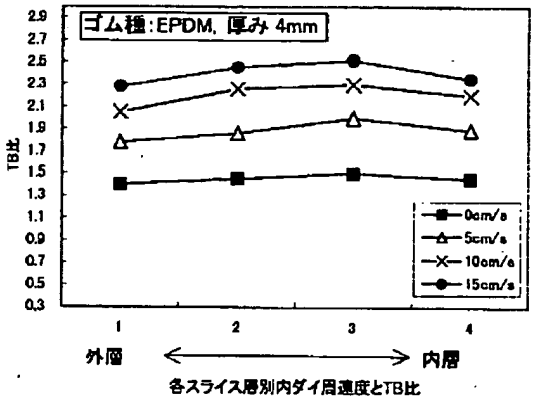
【図4】



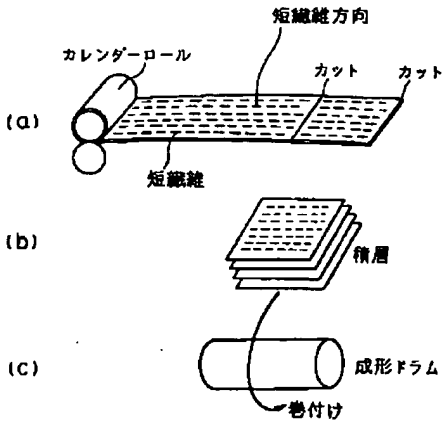
【図6】


ゴム種:CR, 厚み 4mm
TB比
2.9
2.7
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
0.3
1
2
3
4
外層
内層
0cm/s
2.5cm/s
5cm/s
10cm/s
15cm/s
各スライス層別内ダイ周速度とTB比

【図7】


ゴム種:EPDM, 厚み 4mm
TB比
2.9
2.7
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
0.3
1
2
3
4
外層
内層
0cm/s
5cm/s
10cm/s
15cm/s
各スライス層別内ダイ周速度とTB比

【図8】


短繊維方向
カレンダーロール
カット
カット
(a)
短繊維
(b)
積層
(c)
成形ドラム
巻付け

* NOTICES * machine translation for Japan 2002-127227

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] By this invention's relating to the manufacture approach of the rubber sheet containing a staple fiber, and its manufacturing installation, and making a path extend toward a delivery, and making into a cone form the inner die connected with the mandrel in detail, among these rotating a die By giving coincidence, the enlargement and shearing force to the circumferencial direction which becomes large gradually toward a delivery at staple fiber mixing rubber It is related with the manufacture approach of the rubber sheet containing a staple fiber to which cuts open certainly the cylindrical Plastic solid immediately after having extruded the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction, and extruding further, and a sheet is made, and its manufacturing installation.
[0002]
[Description of the Prior Art] The rolling direction of a sheet was made to carry out orientation of the staple fiber in the rubber sheet which supplied the unvulcanized rubber containing a staple fiber and was rolled out by the calendering roll of the pair which changed rotational speed like the rolling sheet production process which shows a staple fiber as an approach of carrying out orientation in the fixed direction in an unvulcanized rubber conventionally at drawing 8 (a), and it was cut according to the belt width of face to fabricate to it. Then, the laminated material which is made to pile up each other's several rolling sheets cut like the laminating process shown in drawing 8 (b), and is continuously carried out a laminating and shown in predetermined thickness in drawing 8 (c) and in which was twisted and the staple fiber carried out orientation crosswise like a process was twisted around the shaping drum, and it was used for production of a transmission belt.
[0003] That is, by the manufacture approach of the transmission belt of V ribbed belt or a low edge V belt, this was vulcanized and it was made the belt sleeve, after having carried out spinning of the core wire which consists of a code spirally, having twisted the compression rubber layer one by one further on this, after twisting 1-two or more covering sail cloth and an adhesion rubber layer around the peripheral surface of a cylinder-like molding drum, and obtaining a layered product. The compression rubber layer used here is the thing of the thickness piled up 3-4 sheets, as shown in above-mentioned drawing 8 (b), and it had twisted around the molding drum that in which the staple fiber carried out orientation crosswise [sheet].
[0004] However, since a sheet rolling direction was not able to be made to fully carry out orientation of the staple fiber, and the rolling sheet had piled up the sheet unavoidably, it had required [if thickness was not made thin,] the great man day for obtaining the sheet for belt shaping.
[0005] As an approach of improving this, to JP,6-9847,B It is what carries out orientation of the staple fiber to the circumferencial direction of an extrusion cylinder object using the extruder furnished with an extended die. The expansion space section from which the depth changes from the predetermined depth of inlet-port space to the predetermined depth of outlet space is prepared in middle space. the cross section of the outlet space of an extended die -- the cross section of inlet-port space -- the specified quantity -- it formed greatly, and the depth of an inlet-port part was still narrower than the depth of an interstitial segment, and what the depth of an outlet part set below to the depth of an interstitial segment was proposed.
[0006] and to JP,6-106602,A The cutting equipment which cuts open the cylindrical elastomer which carried out orientation of the extruded staple fiber to the circumferencial direction to shaft orientations, Form the expansion equipment which develops the elastomer cut open to plate-like, form a guide apparatus between equipment for launching and cutting equipment further, and air is made to blow off from here. The manufacturing installation which prevented generating of the flare as could adjust the inclination of an expansion device so that turbulence of orientation might be prevented and the distance of the both ends of a sheet and a center might become equal about the staple fiber which cools suppressing the contraction to the circumferencial direction of a cylindrical elastomer, and originates in uneven contraction is indicated.
[0007]
[Problem(s) to be Solved by the Invention] However, by the approach of using the conventional extended die, since the rate of orientation was controlled by the force of the flow resulting from a die configuration, if dies were not exchanged, the rate of orientation was unchangeable, although control of the depth ratio of inlet-port space / middle space, and middle space / outlet space, the radius of an inlet-port part / outlet part, and the cross section adjusts the rate of orientation in three dimension.
[0008] Moreover, air is blown off with the guide apparatus formed between equipment for launching and cutting equipment. By the manufacturing installation which prevents turbulence of orientation, the staple fiber resulting from uneven contraction, cooling a cylindrical elastomer and suppressing the contraction to a circumferencial direction Exchange of a cutter was indispensable,

when a remarkable burden was placed on a cutter, especially a cylindrical elastomer with large thickness was cut open over long duration from the place cut to shaft orientations with a cutter, after carrying out air cooling of the extruded cylindrical elastomer.
[0009] By rotating an inner die focusing on the axial center by this invention's making a path extend gradually and making a cone form the inner die connected with the mandrel toward a delivery, regardless of the thickness of a Plastic solid, as a result of inquiring wholeheartedly paying attention to this problem By giving the enlargement and shearing force to the circumferencial direction which becomes large gradually toward a delivery to the rubber containing a staple fiber It aims at offering the manufacture approach of the rubber sheet containing a staple fiber which can carry out [sheet]-izing of the cylindrical Plastic solid immediately after having extruded the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction, and extruding further easily, and its manufacturing installation.
[0010]
[Means for Solving the Problem] That the above-mentioned purpose should be attained invention of this application claim 1 publication In the manufacture approach of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] after kneading the rubber which mixed the staple fiber with the extrusion screw of a cylinder (1) Holding this in an outside die toward a delivery by making the inner die connected with the mandrel into the cone form to which the path was made to extend gradually, and rotating an inner die focusing on the axial center The enlargement and shearing force to a circumferencial direction which become large gradually toward a delivery at the rubber containing a staple fiber are given to coincidence. Carry out extrusion molding of the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction, and the straight-line-like infeed section is put into the surface layer of the cylindrical Plastic solid (2) Extruded at shaft orientations. (3) Tension is given to a circumferencial direction, making a path extend further the cylindrical Plastic solid into which infeed was put, and it is in the manufacture approach of the rubber sheet containing a staple fiber used as a sheet, cutting open the (4) above-mentioned cylindrical Plastic solid in the straight-line-like infeed section.
[0011] By this manufacture approach, since the enlargement and shearing force to a circumferencial direction which become large gradually toward a delivery at the rubber which contains a staple fiber by rotating the inner die of a cone form held in the outside die focusing on that axial center can be given to coincidence, the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction can be acquired. And by adjusting the peripheral velocity of an inner die, since the rate of orientation to the circumferencial direction of a staple fiber is controllable by being able to carry out orientation of the staple fiber to a circumferencial direction also with a cylindrical Plastic solid with large thickness, and carrying out the variate of the peripheral velocity of an inner die, exchange of a die becomes unnecessary. Moreover, it becomes possible to make a sheet easily, cutting it open in this infeed section, giving tension to a cylindrical Plastic solid to a circumferencial direction, after putting the straight-line-like infeed section into the surface layer of the extruded cylindrical Plastic solid to shaft orientations beforehand.
[0012] Invention of this application claim 2 publication makes a path extend the cylindrical Plastic solid immediately after extruding in the auxiliary guide of a cone configuration further, it is the manufacture approach of the rubber sheet containing a staple fiber of giving tension to a circumferencial direction, and sheet-ization by incision becomes easy.
[0013] Invention of this application claim 3 publication is making the auxiliary guide of a cone configuration into susceptor, and pressing a cutter to the front face of a cylindrical Plastic solid, and is in the manufacture approach of the rubber sheet containing a staple fiber of preparing the straight-line-like infeed section in shaft orientations, the staple fiber which carried out orientation to the circumferencial direction of a cylindrical Plastic solid beforehand is cut partially, and sheet-ization by subsequent incision becomes easy.
[0014] When cutting a cylindrical Plastic solid open, invention of this application claim 4 publication is the manufacture approach of giving tension to a circumferencial direction, spraying a compression gas on the interior of a cylindrical Plastic solid, and if it is cut open, it can be sheet-ized easily.
[0015] Invention of this application claim 5 publication is the manufacture approach which contacts the both ends of the sheet which cut the guide member open, and it can be sheet-ized easily, without the edge of the sheet cut open lapping.
[0016] Invention of this application claim 6 publication is the manufacture approach which extruded the cylindrical Plastic solid in the direction which resists gravity, and does not deform a cylindrical Plastic solid with gravity, but extrusion becomes possible in the condition with few dimensional changes.
[0017] Invention of this application claim 7 publication is the manufacture approach rotated focusing on an axial center, cooling the interior of an inner die, even if it raises the peripheral speed of an inner die by cooling the interior of an inner die, it can prevent the scorching of the rubber by internal generation of heat, and as a result, it can carry out orientation of the staple fiber to a circumferencial direction also with a cylindrical Plastic solid with large thickness.
[0018] After invention of this application claim 8 publication kneads the rubber containing a staple fiber with the extrusion screw of a cylinder, In the manufacturing installation of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] The cylinder which kneads the rubber which contains a staple fiber by rotation of an extrusion screw, While holding the extrusion section to which staple fiber mixing rubber is moved by rotation of a mandrel, and the inner die which connected with the mandrel in an outside die and making the path of an inner die extend gradually toward a delivery The die section which carries out extrusion to the cylindrical Plastic solid which an inner die is made pivotable focusing on the axial center, and the enlargement and shearing force to a circumferencial direction were given [Plastic solid], and carried out orientation of the staple fiber to the circumferencial direction, An infeed means to prepare the straight-line-like infeed section in the surface layer of the cylindrical

Plastic solid immediately after extruding to shaft orientations, It is in the manufacturing installation of the rubber sheet containing a staple fiber equipped with an extended means to give tension further to the cylindrical Plastic solid into which infeed was put to a circumferencial direction, and a cutting means to cut a cylindrical Plastic solid open in the straight-line infeed part of the above.
[0019] Since the shearing force of enlargement and a hand of cut is given [the circumferencial direction which becomes large gradually toward a delivery like claim 1 publication] to staple fiber mixing rubber at coincidence, the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction can be acquired. And by adjusting the peripheral velocity of an inner die, the rate of orientation to the circumferencial direction of a staple fiber can be controlled by being able to carry out orientation of the staple fiber to a circumferencial direction also with a cylindrical Plastic solid with large thickness, and carrying out the variate of the peripheral velocity of an inner die, and exchange of a die becomes unnecessary. Moreover, giving tension to a cylindrical Plastic solid to a circumferencial direction, after putting the straight-line-like infeed section into the surface layer of the extruded cylindrical Plastic solid to shaft orientations beforehand, in order to cut it open in this infeed section, it becomes possible to make a sheet easily.
[0020] Invention of this application claim 9 publication Since an extended means is in the manufacturing installation of the rubber sheet containing a staple fiber which is made to extend a path for the cylindrical Plastic solid immediately after extruding further, and gives tension to a circumferencial direction and which is the auxiliary guide of a cone configuration and tension is applied to the cylindrical Plastic solid at the circumferencial direction, sheet-ization by incision becomes easy.
[0021] The manufacturing installation of the rubber sheet containing a staple fiber whose susceptor of this cutter it is a cutter and is the auxiliary guide of a cone configuration which an infeed means presses a cylindrical Plastic solid from a front face, and prepares the straight-line-like infeed section in shaft orientations has invention of this application claim 10 publication, the staple fiber which carried out orientation to the circumferencial direction of a cylindrical Plastic solid beforehand is cut partially, and sheet-ization by subsequent incision becomes easy.
[0022] Since the manufacturing installation of the rubber sheet containing a staple fiber which is gas blasting equipment which gives tension to a circumferencial direction has invention of this application claim 11 publication and it has required tension for the cylindrical Plastic solid like claim 9 at the circumferencial direction, spraying a compression gas on the interior of the cylindrical Plastic solid immediately after extruding an extended means, sheet-ization by incision becomes easy.
[0023] Invention of this application claim 12 publication can be sheet-ized completely, without being in the manufacturing installation of the rubber sheet containing a staple fiber arranged so that the both ends of the sheet which the guide member cut open may be contacted, and the edge of the sheet cut open lapping.
[0024] The inner die which invention of this application claim 13 publication rotates focusing on an axial center is in the manufacturing installation of the rubber sheet containing a staple fiber equipped with the equipment which cools the interior, can raise the peripheral speed of an inner die by cooling an inner die, and, as a result, can carry out orientation of the staple fiber to a circumferencial direction also with a cylindrical Plastic solid with large thickness.
[0025] Cone-angle theta which the path of an inner die extends gradually toward a delivery is 30 degrees <= theta< 90 degrees, and invention of this application claim 14 publication has extended ratio B/A which is the ratio of the diameter A of min of an inner die, and an overall diameter B in the manufacturing installation of the rubber Plastic solid containing a staple fiber which are 1.5-12.5.
[0026] Invention of this application claim 15 publication has the depth of an inner die and an outside die in the manufacturing installation of the rubber Plastic solid containing a staple fiber uniform from root Motobe to a delivery which the inner die connected with the mandrel.
[0027] The manufacturing installation which has arranged the die section has invention of this application claim 16 publication so that a cylindrical Plastic solid may be extruded in the direction which resists gravity, it does not deform a cylindrical Plastic solid with gravity, but extrusion becomes possible in the condition with few dimensional changes.
[0028]
[Embodiment of the Invention] Hereafter, the schematic diagram of the manufacturing installation of the rubber Plastic solid containing a staple fiber which drawing 1 requires for this invention, and drawing 2 are the sectional views of an inner die. In the manufacturing installation 1 of the rubber Plastic solid containing a staple fiber of this invention The cylinder 2 which kneads the rubber which contains a staple fiber by rotation of the extrusion screw 3, The interconnecting tube 4 which moves the staple fiber mixing rubber 6 which passed the perforated plate 5 to the following tubing, The extrusion section 7 which moves the staple fiber mixing rubber 6 sent from the interconnecting tube 4 to degree process by rotation of a mandrel 8, Making a path extend gradually, and holding this in the outside die 10 toward a delivery 11, by making into a cone form the inner die 9 connected with the mandrel 8, and rotating the inner die 9 focusing on the axial center The enlargement and shearing force of a circumferencial direction which become large gradually toward a delivery 11 about staple fiber mixing rubber 6 are given to coincidence. The die section 15 which carries out extrusion molding of cylindrical Plastic solid 13 which carried out orientation of the staple fiber to the circumferencial direction, The surface layer of a cylindrical Plastic solid is equipped with a cutting means 40 to cut open an infeed means 50 to prepare the straight-line-like infeed section, an extended means 35 to give tension to a circumferencial direction further at the cylindrical Plastic solid into which infeed was put, and a cylindrical Plastic solid, in the straight-line infeed part of the above, to shaft orientations.
[0029] A cylinder 2 holds the extrusion screw 3 pivotable into this, the rubber compound containing a staple fiber is put in from raw material input port 17, and by rotation of the extrusion screw 3, kneads a staple fiber and rubber and makes them staple fiber mixing rubber 6. The gas which occurred from the air and the rubber compound in a cylinder 2 at this time is discharged from an

exhaust port (not shown). Although the temperature of a cylinder 2 is changed according to a rubber kind, it is usually adjusted by 40-100-degreeC, and is made the temperature which a staple fiber tended to mix to rubber. Moreover, the mixing time in this case is adjusted to extent to which vulcanization of rubber does not advance.

[0030] An interconnecting tube 4 guides staple fiber mixing rubber 6 to the extrusion section 7.

[0031] In the extrusion section 7, it changes into the condition that heat and carry out heat plasticization of this staple fiber mixing rubber 6, and it tends to carry out extrusion molding to 40-100-degreeC, giving shearing force to the staple fiber mixing rubber 6 sent from the interconnecting tube 4 by rotation of the mandrel 8 held in the extrusion section 7.

[0032] Making a path extend gradually, making into a cone form the inner die 9 connected with the mandrel 8 toward a delivery 11, and holding this in the outside die 10, and rotating the inner die 9 focusing on the axial center X, the die section 15 gives the enlargement and shearing force to a gradually big circumferencial direction for staple fiber mixing rubber 6 toward a delivery 11, and carries out extrusion molding of cylindrical Plastic solid 13 which carried out orientation of the staple fiber to the circumferencial direction.

[0033] And it is fixed to the cylinder 2 and right angle which have been arranged horizontally, and the die section 15 does not deform cylindrical Plastic solid 13 for cylindrical Plastic solid 13 moreover extruded from a delivery 11 with gravity by being placed so that gravity may be resisted, but makes extrusion possible in the condition with few dimensional changes.

[0034] A pivot 30 is fixed to the stationary plate 34 to which the end was fixed with the nut 31 by the inner die 9 and a mandrel 8 preparing a gap, and equipping a pivot 30 with it, and the other end is supported by the frame 33. The pulley 32 furnished with a driving belt (not shown) fixes to a mandrel 8, and makes coincidence rotate the inner die 9 and a mandrel 8 by making a pivot 30 into an axis by transit of this driving belt.

[0035] Moreover, the inner die 9 becomes homogeneity from root Motobe 14 who connected with the mandrel 8 to a delivery 11, and cylindrical Plastic solid 13 of the uniform thickness which does not have a sink and internal distortion smoothly is made to the depth W of the inner die 9 and the outside die 10 to shaft orientations D, without applying brakes to the extrusion of cylindrical Plastic solid 13.

[0036] The configuration of the inner die 9 becomes the factor which affects the magnitude of shearing force. In this example, as shown in drawing 2 , cone-angle theta which a path extends gradually toward a delivery 11 from root Motobe 14 is 30 degrees <= theta< 90 degrees, and extended ratio B/A whose overall diameters B the diameter A of min of the inner die 9 is 20-170mm, and are 100-250mm and a ratio of those is set as 1.5-12.5. If it is under this setting range, in the outer layer of cylindrical Plastic solid 13 with the small enlargement to the circumferencial direction of delivery 11 near [the inner die 9], and big thickness, a staple fiber will not carry out orientation to a circumferencial direction. On the other hand, when this setting range is crossed and extrusion pressure is [the enlargement to a circumferencial direction becomes large too much and] inferior, cylindrical Plastic solid 13 tends to split.

[0037] Moreover, the peripheral velocity determined with the rotational frequency and overall diameter B of the inner die 9 has also affected the magnitude of shearing force. If it is hard coming to carry out orientation of the staple fiber to a circumferencial direction in the outer layer of big cylindrical Plastic solid 13 the peripheral velocity is 2.5-35cm/second, are 5.0-20cm/second preferably, small [to the case of less than 2.5cm/second] the shearing force in the delivery of inner die 9 11 neighborhood and thick and exceeds in 35cm/second on the other hand, shearing force will become large, internal generation of heat becomes large, and rubber burning occurs with vulcanization of this staple fiber mixing rubber 6.

[0038] In order to control internal generation of heat of the staple fiber mixing rubber 6 between the inner die 9 and the outside die 10, the cooling system 19 made to circulate through cooling water can be formed in the interior of the inner die 9 connected with a mandrel 8 and this. The path 21 which put in cooling water from the exterior of the inner die 9, and was prepared in the inner die 9 and the mandrel 8 with the pump 20 is passed, and it is made to discharge and circulate to the inner die 9 in a cooling system 19. Since it can press down internal generation of heat of rubber, the above-mentioned cooling system 19 can raise the peripheral velocity of the inner die 9, and even if large, it can carry out extrusion molding of thick cylindrical Plastic solid 13 in which the staple fiber carried out orientation to the circumferencial direction.

[0039] The infeed means 50 has the function to form the straight-line-like infeed section 51 in the surface layer of cylindrical Plastic solid 13 immediately after extruding as shown in drawing 4 in accordance with shaft orientations D. That is, although the rotating disc-like infeed cutter 52 presses the surface layer of cylindrical Plastic solid 13, cuts some staple fibers which carried out orientation to the circumferencial direction and forms the infeed section 51 of the shape of a continuous straight line, since the auxiliary guide 36 of the cone configuration shown below is in contact with the interior of above-mentioned cylindrical Plastic solid 13, this is functioning as susceptor of the infeed cutter 52. 30 - 90% of the depth of the infeed section 51 to cylindrical Plastic solid 13 is desirable to the thickness of cylindrical Plastic solid 13. At less than 30%, incision of the sheet which is the following process becomes difficult.

[0040] As one of the extended means 35 which gives tension to a circumferencial direction, the auxiliary guide 36 of a cone configuration is inserted in cylindrical Plastic solid 13 immediately after extrusion possible [the slip to a pivot 30]. By the auxiliary guide 36 being rich in a mold-release characteristic with cylindrical Plastic solid 13 of polyamide resin, a fluororesin, etc., a lightweight thing is desirable, and although a dimension will not be asked if there is a function which deforms in the direction where cylindrical Plastic solid 13 immediately after extruding extends a path, a path should just be gradually extended toward shaft orientations D. The fault for which are 5-60 degrees, distance if it becomes less than 5 degrees, until it will become impossible to cut it open easily [the tension to a circumferencial direction is small and] and cylindrical Plastic solid 13 will sheet-ize becomes long, the sheet 44 cut open deforms the cone angle with a self-weight, and it becomes impossible to cut open

correctly happens. When 60 degrees is exceeded, tension becomes large too much to a circumferencial direction, the incision direction becomes unstable, and it may be able to stop being able to cut it open correctly to bilateral symmetry on the other hand.
[0041] Moreover, as other extended means 35, it is gas blasting equipment 37 which discharges the compressed air, and has the function which cylindrical Plastic solid 13 immediately after extruding is expanded, and is pulled to a circumferencial direction, and the function in which an early stage cools cylindrical Plastic solid 13. This gas blasting equipment 37 is arranged to the exterior of cylindrical Plastic solid 13, consists of a compressor (not shown) which supplies the compressed air, and a nozzle 38 which connected with this and was installed in the interior of cylindrical Plastic solid 13, discharges the compressed air 39 in the many directions from a nozzle 38, expands cylindrical Plastic solid 13, and gives tension to a circumferencial direction. There is work which incision of cylindrical Plastic solid 13 becomes [work] easy, and cylindrical Plastic solid 13 is cooled [work] at an early stage, and the scorching of rubber is prevented [work], and stabilizes quality by this.
[0042] A cutting means 40 to cut cylindrical Plastic solid 13 open to shaft orientations D consists of cutters, such as a cutter and a knife, or a laser knife, and supersonic vibration, it is cut so that cylindrical Plastic solid 13 may be torn, is located in the central part of cylindrical Plastic solid 13, and is cut to bilateral symmetry. Of course, if it heats for a cutting means 40 like a cutter, incision of cylindrical Plastic solid 13 can also be made easy. Moreover, in the case of the cutter used here, the body-of-revolution cutter which can rotate is desirable, and this can cut cylindrical Plastic solid 13 easily.
[0043] It is the product made of synthetic resin, a metal rod-like structure, and a tube-like object, and the guide member 43 is arranged before the guide roll 46 so that the both ends 45 of the sheet 44 which both ends 45 cut open may be contacted. It sheet-izes completely, without the edge 45 of the sheet 44 cut open bending, and it can twist to the guide roll 46 and can be made to move to it continuously.
[0044] The independence of rubber material, such as an ethylene-alpha olefin elastomer which the rubber used here becomes from the mixed polymer of natural rubber, isobutylene isoprene rubber, a styrene butadiene rubber, chloroprene rubber, ethylene-propylene rubber, alkylation chloro sulfane-ized polyethylene, hydrogenated nitrile rubber, hydrogenated nitrile rubber, and an unsaturated-carboxylic-acid metal salt, ethylene-propylene rubber (EPR), or an ethylene propylen dien monomer (EPDM), or such mixture are used. As an example of a diene monomer, a dicyclopentadiene, methylene norbornene, ethylidene norbornene, 1, 4-hexadiene, cyclo-octadiene, etc. are raised.
[0045] It consists of fiber, such as an aramid fiber, a polyamide fiber, polyester fiber, and cotton, although the die length of fiber changes to the above-mentioned rubber with classes of fiber, the staple fiber which is about 1-10mm is used for it, for example, an about 5-10mm thing is used for it as they are about 3-5mm, a polyamide fiber, polyester fiber, and cotton as it is an aramid fiber. The addition is 10 - 40 weight section to the rubber 100 weight section.
[0046] Furthermore, a softener, the reinforcing agent which consists of carbon black, a bulking agent, an antioxidant, a vulcanization accelerator, a vulcanizing agent, etc. are added by the rubber of this invention.
[0047] As the above-mentioned softener, the softener of common petroleum systems, such as phosphate, such as sebacate systems, such as horse mackerel peat systems, such as phthalate systems, such as the common plasticizer for rubber, for example, dibutyl phthalate, (DBP), and dioctyl phthalate (DOP), and dioctyl adipate (DOA), and dioctyl sebacate (DOS), and tricresyl phosphate, is contained.
[0048] this invention -- beforehand -- rubber -- even if few, a staple fiber is ****(ed) with an opening roll, a kneading machine, etc., and a masterbatch is produced. By this approach, after throwing in and kneading the staple fiber of 10 - 40 weight section in the polymer 100 weight section with an opening roll, the kneaded masterbatch is once emitted and this is cooled to 20-50-degreeC. This is for preventing the scorching of rubber.
[0049] In addition, the softener of 1 - 10 weight section can be thrown in with a staple fiber. There is effectiveness which prevents the concordance of a staple fiber and rubber becoming good, and about [that distribution into rubber becomes good] and the staple fiber itself becoming entangled, and becoming cotton-like by this. namely, a softener -- a staple fiber -- permeating -- base -- [0050] to which a role of lubricant for a tangle of fiber to get loose is played, and it prevents that a staple fiber becomes cotton-like, and the concordance of a staple fiber and rubber becomes good, and distribution of a staple fiber becomes good Then, although it extrudes from the die section 15 connected at the tip of a mandrel 8 and cylindrical Plastic solid 13 is manufactured after kneading the rubber containing a staple fiber with the extrusion screw 3 of a cylinder 2 Making a path extend gradually, making into a cone form the inner die 9 connected with the mandrel 8 like **** toward a delivery, and holding this in the outside die 10, and rotating the inner die 9 focusing on the axial center X The enlargement and shearing force of a circumferencial direction which become large gradually toward a delivery 11 about staple fiber mixing rubber 6 are given, and extrusion molding of cylindrical Plastic solid 13 which carried out orientation of the staple fiber 22 to the circumferencial direction is carried out.
[0051] Then, cylindrical Plastic solid 13 by which extrusion molding was carried out continuously It is a thing with a thickness of 1-10mm as for which the staple fiber 22 carried out orientation to the circumferencial direction, having applied to the outer layer from the inner layer. By using combining the above-mentioned extended means 35, the incision means 40, and the guide member 43, the direction of extrusion can be followed, it can be cut open, and the long perfect sheet 44 with which the width of face (overall diameter Bxpi of the inner die 9) in which the staple fiber 22 carried out orientation crosswise continued can be obtained. This can be twisted around the peripheral surface of the molding drum of degree process, and it can be used for shaping of a transmission belt after that.
[0052]
[Example] Next, the concrete example of the manufacture approach of the rubber Plastic solid containing a staple fiber is shown below.

After throwing in and kneading a staple fiber to rubber with an opening roll beforehand using the chloroprene rubber compound shown in one to example 2 table 1, and the EPDM rubber compound shown in Table 2, the kneaded masterbatch is once emitted and this is cooled to ordinary temperature. It supplied to the cylinder of the manufacturing installation of the rubber Plastic solid containing a staple fiber which shows this masterbatch and other compounding agents to drawing 1 , and the staple fiber was mixed by rotation of an extrusion screw. And rotating an inner die on the conditions shown in Table 3 focusing on the axial center, the enlargement and shearing force of a circumferencial direction which become large gradually toward a delivery about staple fiber mixing rubber were given, and extrusion molding of the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction was carried out.

[0053] Furthermore, tension was further given to the circumferencial direction with the auxiliary guide (the cone angle of 30 degrees, die length of 60mm) of a cone configuration with which the cylindrical Plastic solid extruded continuously was equipped possible [a slip] to the revolving shaft, and the compressed air of atmospheric-pressure 6 kgf/cm2 was supplied from the nozzle with gas blasting equipment, the cylindrical Plastic solid was expanded, and tension was given to the circumferencial direction. And the knife was used as a cutting means, and the rod-like guide member (the diameter of 30mm, die length of 600mm) has been arranged before a guide roll, and the both ends of the sheet cut open were made to contact.

[0054]

[Table 1]

配合薬品	重量部
CR（硫黄変性タイプ）	100
ステアリン酸	2
ナイロンカット糸	15
アラミドカット糸	5
オイル	5
カーボンブラック	25
老化防止剤	4
ビスマレイミド	2
ZnO	5

[0055]

[Table 2]

配合薬品	重量部
EPDM	100
ﾅｲﾛﾝｶｯﾄ糸	15
ｱﾗﾐﾄﾞｶｯﾄ糸	5
ｽﾃｱﾘﾝ酸	1
酸化亜鉛	5
ｶｰﾎﾞﾝﾌﾞﾗｯｸ	50
ｵｲﾙ	10
老化防止剤	2
N,N-m-ﾌｪﾆﾚﾝｼﾞﾏﾚｲﾐﾄﾞ	2
ﾊﾟｰｵｷｻｲﾄﾞ	8

[0056] The depth of the temperature of the extrusion screw of the process condition in this example, the peripheral velocity (variate) of a rotational frequency and an inner die, temperature, the thickness of a cylindrical Plastic solid, an outer diameter, discharge quantity, the inside-and-outside layer temperature of a cylindrical Plastic solid and the thickness of a cylindrical Plastic solid, the diameter of min of an inner die, an overall diameter, an extended ratio, and the infeed section, the cone angle of an auxiliary guide and die length, the pressure of the compressed air and the diameter of a rod-like guide member, die length, etc. are shown in Table 3.

[0057]

[Table 3]

	実施例1	実施例2
ゴム種	CR	EPDM
スクリュー温度（℃）	45	90
スクリュー回転数（rpm）	5．0	5．0
シリンダー後部温度（℃）	70	85
シリンダー前部温度（℃）	75	90
内ダイ温度（℃）	75	90
内ダイ周速度	2．5～15	5～15
内ダイの最小径A（mm）	54	54
内ダイの最大径B（mm）	190	190
内ダイの最大径B／最小径A	3．5	3．5
内ダイの長さ（mm）	150	150
吐出量（kg／hr）	10	22．0
円筒状成形体外層温度（℃）	80～110	90～110
円筒状成形体内層温度（℃）	80～125	100～120
円筒状成形体の厚み（mm）	4．0	4．0
切込み部の深さ（mm）	2．4	2．4
補助ガイドのテーパー角度（°）	30	30
補助ガイドの長さ（mm）	60	60
圧縮空気の圧力（kgf／cm²）	6	6
ガイド部材の直径（mm）	30	30
ガイド部材の長さ（mm）	600	600

[0058] The sheet obtained in this way does not have the lap of an edge, either, and was able to be continuously cut open without the trouble. Moreover, the staple fiber stacking tendency of a sheet was evaluated. In this evaluation, as shown in drawing 5 , the sheet was sliced to four sheets and classified into four layers of outer layer ** to inner layer **. It is JIS about each tensile strength (TB) of the circumferencial direction of each of these sheets, and shaft orientations. It measured according to K6251 and asked for the tensile strength ratio (TB ratio) (a circumferencial direction/shaft orientations). The stacking tendency to the circumferencial direction of a staple fiber is good, so that a tensile strength ratio is so large that the tensile strength of a circumferencial direction is large compared with the tensile strength of shaft orientations. The result is shown in drawing 6 and drawing 7 .

[0059] TB ratio becomes high and it turns out that the staple fiber is carrying out orientation to the circumferencial direction more as according to this there is no difference of a staple fiber stacking tendency in an outer layer and a inner layer and the peripheral velocity of an inner die becomes high.

[0060]

[Effect of the Invention] In invention which relates to this application claim as mentioned above, since the enlargement and shearing force to a circumferencial direction which become large gradually toward a delivery at the rubber which contains a staple fiber by rotating the inner die of a cone form held in the outside die focusing on the axial center can be given to coincidence, the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction can be acquired. And by adjusting the peripheral velocity of an inner die, since the rate of orientation to the circumferencial direction of a staple fiber is controllable by being able to carry out orientation of the staple fiber to a circumferencial direction also with a cylindrical Plastic solid with large thickness, and carrying out the variate of the peripheral velocity of an inner die, exchange of a die becomes unnecessary. Moreover, it is effective in becoming possible to make a sheet easily, cutting it open in this infeed section, giving tension to a cylindrical Plastic solid to a circumferencial direction, after putting the straight-line-like infeed section into the surface layer of the extruded cylindrical Plastic solid to shaft orientations beforehand.

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]

[Claim 1] In the manufacture approach of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] after kneading the rubber which mixed the staple fiber with the extrusion screw of a cylinder Holding this in an outside die toward a delivery by making the inner die connected with the mandrel into the cone form to which the path was made to extend gradually, and rotating an inner die focusing on the axial center The enlargement and shearing force to a circumferencial direction which become large gradually toward a delivery are given to the rubber containing a staple fiber. Carry out extrusion molding of the cylindrical Plastic solid which carried out orientation of the staple fiber to the circumferencial direction, and the straight-line-like infeed section is put into the surface layer of the extruded cylindrical Plastic solid at shaft orientations. The manufacture approach of the rubber sheet containing a staple fiber characterized by what tension is given to a circumferencial direction, making a path extend further the cylindrical Plastic solid into which infeed was put, and is made a sheet, cutting the above-mentioned cylindrical Plastic solid open in the straight-line-like infeed section.

[Claim 2] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 of making a path extending the cylindrical Plastic solid immediately after extruding in the auxiliary guide of a cone configuration further, and giving tension to a circumferencial direction.

[Claim 3] The manufacture approach of the rubber sheet containing a staple fiber according to claim 2 of preparing the straight-line-like infeed section in shaft orientations by making the auxiliary guide of a cone configuration into susceptor, and pressing a cutter to the front face of a cylindrical Plastic solid.

[Claim 4] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 or 2 of giving tension to a circumferencial direction while spraying a compression gas on the interior of a cylindrical Plastic solid when cutting a cylindrical Plastic solid open.

[Claim 5] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 to 4 which contacts the both ends of the sheet which cut the guide member open.

[Claim 6] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 to 5 which extruded the cylindrical Plastic solid in the direction which resists gravity.

[Claim 7] The manufacture approach of the rubber sheet containing a staple fiber according to claim 1 to 6 rotated focusing on an axial center while cooling the interior of an inner die.

[Claim 8] In the manufacturing installation of the rubber sheet containing a staple fiber to which extrudes from the die connected at the tip of a mandrel, and a sheet is made from the acquired rubber form tubed [containing a staple fiber] after kneading the rubber which mixed the staple fiber with the extrusion screw of a cylinder The cylinder which kneads the rubber which contains a staple fiber by rotation of an extrusion screw, While holding the extrusion section to which staple fiber mixing rubber is moved by rotation of a mandrel, and the inner die which connected with the mandrel in an outside die and making the path of an inner die extend gradually toward a delivery The die section which carries out extrusion to the cylindrical Plastic solid which an inner die is made pivotable focusing on the axial center, and the enlargement and shearing force to a circumferencial direction were given Plastic solid], and carried out orientation of the staple fiber to the circumferencial direction, An infeed means to prepare the straight-line-like infeed section in the surface layer of the cylindrical Plastic solid immediately after extruding at shaft orientations, The manufacturing installation of the rubber sheet containing a staple fiber characterized by having an extended means to give tension further to the cylindrical Plastic solid into which infeed was put to a circumferencial direction, and a cutting means to cut a cylindrical Plastic solid open in the straight-line infeed part of the above.

[Claim 9] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 whose extended means is the auxiliary guide of the cone configuration which is made to extend a path for the cylindrical Plastic solid immediately after extruding further, and gives tension to a circumferencial direction.

[Claim 10] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 9 whose infeed means is the cutter which presses a cylindrical Plastic solid from a front face, and prepares the straight-line-like infeed section in shaft orientations and whose susceptor of this cutter is the auxiliary guide of a cone configuration.

[Claim 11] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 or 9 whose extended means is gas blasting equipment which gives tension to a circumferencial direction while spraying a compression gas on the interior of the cylindrical Plastic solid immediately after extruding.

[Claim 12] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 to 11 arranged so that the both ends of the sheet which the guide member cut open may be contacted.
[Claim 13] The inner die which rotates focusing on an axial center is the manufacturing installation of the rubber sheet [equipped with the equipment which cools the interior] containing a staple fiber according to claim 8 to 12.
[Claim 14] Cone-angle theta which the path of an inner die extends gradually toward a delivery is the manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 to 13 whose extended ratio B/A which is 30 degrees <= theta< 90 degrees, and is the ratios of the diameter A of min of an inner die and an overall diameter B is 1.5-12.5.
[Claim 15] The depth of an inner die and an outside die is the manufacturing installation of the rubber sheet [uniform from root Motobe whom the inner die connected with the mandrel to a delivery] containing a staple fiber according to claim 8 to 14.
[Claim 16] The manufacturing installation of the rubber sheet containing a staple fiber according to claim 8 to 15 which has arranged the die section so that a cylindrical Plastic solid may be extruded in the direction which resists gravity.

[Translation done.]